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Editorial

THE VETERINARY INSPECTOR AS THE GUARDIAN OF THE FOOD SUPPLY OF THE NATION.

THAT the man who studies the diseases of animals and animal flesh *should* be the best, and indeed the *only* proper person to say "Yea" and "Nay" over the question of whether the flesh brought in front of him is diseased or not, seems to be indisputable, and yet how few of the big cities and towns of England have veterinary surgeons as meat inspectors.

On the Continent they do things better, and even in Great Britain our far-seeing Scottish legislators over the Border have, as usual in all educational and sanitary matters, given the "Sassenach" a lead in regard to both meat and milk.

The necessity for skilled veterinary inspection has never been more clearly amplified than over the recent question raised in Parliament in regard to the importation of diseased carcases of mutton from New Zealand.

Between September, 1928, and February, 1929, over 21,000 sheep carcases from this country, out of a total of about 284,000, were found upon veterinary inspection to be suffering from caseous lymphadenitis, and out of these no less than 17,593 were discovered in

London—in the districts, respectively, of the City of London, Finsbury or Southwark—whereas a further 3,336 were discovered in Liverpool, out of a total of 54,668. Some 70 cases were discovered at Southampton out of only 2,131 carcases, and, altogether, since September 1st, 1928, there have been no less than 17,593 carcases condemned.

Even if there were no other diseases about, the above figures of carcases sent from our premier exporting colony illustrate beyond argument the necessity for an efficient Municipal Veterinary Service; and the young graduate of to-day has opportunities in this direction which were never even available when the present generation of elderly practitioners was in its student days.

The prospects of occupying a well-paid billet are alluring, but it is up to the individual who fancies that side of the profession as his career to see that the pay and conditions are satisfactory—and there never was a time when "vis unita fortior" ought to be our motto—and be acted upon practically.

That "the labourer is worthy of his hire" is a very old proverb, and one which we of the veterinary profession seem always to have fought shy of making complaints. Now, however, is the opportunity to assert our rights and get adequate pecuniary remuneration, for one must not forget that it is a whole-time job.

Let, therefore, the newly qualified man bear this in mind, and not forget that no one can legitimately have his name on the Register of the Royal College unless he has gone through the whole of the syllabus and taken all the qualifying examinations—a period of intense and unceasing study for four, or may be five, or even six, years.

General Article

THE LUNG WORM AND THE STOMACH WORM IN THE CAT.

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Introduction.

In 1865, Leuckart found in the stomach of the domestic cat a minute bursate worm which he named *Ollulanus tricuspis*.

He found also what he believed were the free larvæ of Ollulanus; forms which measured about 320μ long by 15μ wide, had a truncated oral extremity and a short tail which ended in a short S-shaped tip (Pl. 1 (a)): the œsophagus was between one-third and one-half of the total length of the intestine. Although there are seldom more than three embryos inside the female, larvæ were usually found in large numbers throughout the whole intestinal tract of the host, as well as encysted (in cysts ·15 to ·2 mm. in diameter) on various internal organs. The cyst wall had a connective tissue-like structure of such thickness that it might be three or four times the diameter of the enclosed space. This space was either filled by the tightly wound coils of the worm or with a clear liquid. If present in large numbers in the lungs, these capsules caused the appearance of miliary tuberculosis—especially when surrounded by an area of hepatisation. They might even be the focus of a widespread inflammation which in one of his cases at least, led to the death of the cat. Embryos were not found in the blood or muscles, but in heavy infections were free in the bronchi.

The encysted embryos, unlike Trichinella, did not continue their development, but gradually degenerated, and finally came to resemble an egg. Leuckart fed these embryos to a mouse and six weeks later found hundreds of them encapsuled in the muscles—these forms being intermediate in form between the free embryo and the fully developed Ollulanus. The capsules—about ·3 mm.—were not only found in the rump muscles and œsophageal wall, but also in the heart and in the loose connective tissue of the neck. The wall was a simple connective tissue one, surrounded by nodules and containing numerous granules which were moved about by the movements of the larva (Pl. 1 (b)). The enclosed worm had increased in size and was about ·8 mm. long by ·04 mm. broad. The blunt end showed a retracted chitinous

disc which, from analogy, might be taken as the first indications of the future mouth. The cuticle was thicker and ringed. Round the lip-like projections were a few papilla-like outgrowths. The tail was simple and pointed. The intestine had not changed except that the pharynx was comparatively shorter and showed a muscular structure. The intestine was brown and towards its middle the slightly enlarged bean-shaped genital primordia could be seen.

He was unable to decide whether these stages had reached maturity, but going by the results of an experiment, he considered that further development in the mouse was possible. An infected mouse was fed to a cat and eight days later the worms were recovered from it unchanged, but in the cæcum and rectum, not the stomach. As only a few were found, it was believed that they were en route for the exterior and Leuckart considered that all the conditions necessary for further development were not present.

Plate 1.—(a) Embryo of *Ollulanus tricuspis* (after Leuckart, 1867).
(b) Encapsulated embryo in muscles of mouse (after Leuckart, 1867).

Only one other experiment is recorded. Two young rats were fed with the stomach wall of a cat infected with Ollulanus larvæ, and after 24 hours and three days respectively, the majority of the introduced worms were recovered alive and undamaged in the stomach.

Cobbold in Britain was also studying the parasite, although he preferred to use the name Olulanus instead of the more correct Ollulanus.

In discussing the probable life histories of the lung worms in general, Cobbold (1875) drew attention to Leuckart's belief that "all these strongyloides required a change of hosts before they can take up their final abode in the sexually mature state. This he infers especially because their respective embryos display characters very similar to those exhibited by Olulanus."

He considered the question fully in a paper read before the Queckett Microscopical Club in 1885. He stated that his first acquaintance

with the larvæ of Olulanus was made about 35 years previously, when a young cat in his room suddenly rushed about and finally fell dead, asphyxiated. While yet warm, it was dissected and its lungs were found to be swarming with nematode larvæ. Drawings were made, but no specimens were preserved, and it is not stated whether any adults were seen in the stomach.

He then briefly recapitulated Leuckart's work on the subject, and described a case which he had seen with Mr. Gay, a surgeon, in which a family, together with their donkey and cat, had suffered from a condition which was suspected to be Trichinosis. On investigation, no evidence of this was found, but the lungs of the exhumed cat were

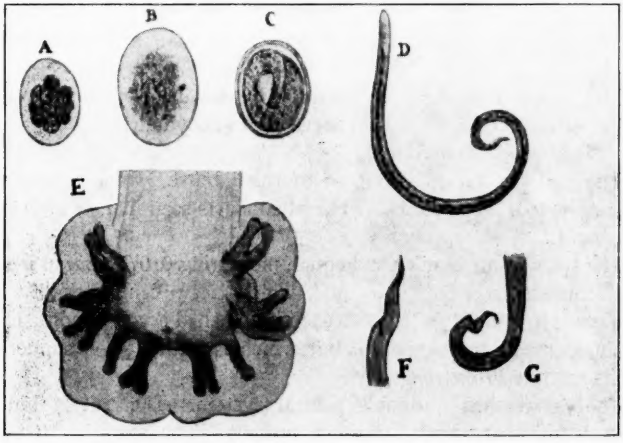


Plate 2.—(a), (b), and (c), Eggs of *Strongylus pusillus* (after Railliet). (d) Free embryo (after Railliet). (e) Bursa of *Strongylus pusillus* (after Müller). (f) and (g) Posterior ends of embryos (after Müller)

found to be swarming with "Nematoids." Cobbold considered that this was a case of "Olulanosis," and states that "Whatever interpretation be put upon the human outbreak, the coincidence of the occurrence in man of an affection symptomatic of trichinosis, found in association with a trichinoid affection in an animal which proved olulaniasis, was both curious and instructive."

No subsequent work on the subject seems to have been done, excepting some negative experimental attempts at infection by Galli-Valerio in 1921.

Meanwhile, in 1890, Müller described from the cat in Germany a new form of lung-worm which he called *Strongylus pusillus*, and Railliet (1898) proposed the new specific name of *S. abstrusus* instead.

Later (1907) Railliet and Henry transferred this species to the genus Synthetocaulus, a genus recently shown by Leiper to be a synonym of Protostrongylus.

It is unnecessary to recapitulate Müller's description of this parasite. The original figures are reproduced (Pl. 2), which show that Leuckart had confused two separate and distinct parasites in his work. This is further confirmed in the account of the life histories which follows.

Both of these parasites have been mentioned in veterinary literature since the dates of their discovery, but nothing has been added to our knowledge of their morphology and life history.

The "Lung-Worm" of the Cat.

The length is approximately 4 mm. in the male and 9 mm. in the female.

The mouth opening is surrounded by six inconspicuous papillæ, and opens directly into the short almost cylindrical œsophagus, which is about 0·25 mm. long.

The male has a small but well-formed bursa, which is complete and undivided. The cuticular bursal supports seen in *Protostrongylus* are absent.

The spicules are similar and equal, measuring 0·075 mm. in length. Each consists of a cuticular tube, which is swollen anteriorly, but terminates in a blunt point. To each is attached a voluminous sheath which is transversely striated, but which is without the supporting fingers seen in *Protostrongylus*.

The female has a double genital system. The tail is bluntly pointed and there are no papillæ present. The anus is 0·04 mm. from the tip of the tail and the rectum is very short. The vulva is 0·09 mm. from the anus and communicates with a long single vagina, which in turn joins the two parallel uteri. The vagina is about 1·5 mm. long and contains unsegmented eggs measuring about 80μ long by 70μ broad.

This parasite was originally placed in the genus *Protostrongylus* by Kamensky, and in the genus *Synthetocaulus* (which is a synonym of Protostrongylus) by Railliet and Henry, but it obviously does not belong to the same genus as *Protostrongylus rufescens* ; and accordingly the new genus *Aelurostrongylus* has been created by the writer for its reception. Its correct name is therefore *Aelurostrongylus abstrusus*.

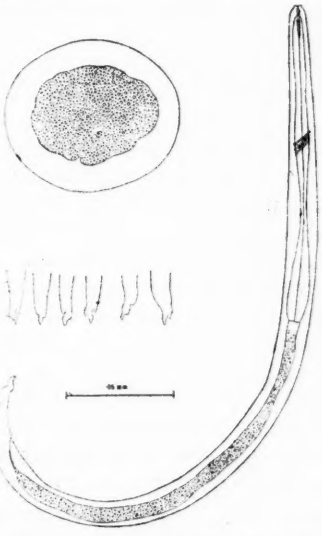
The Morphology of the Larva in the Cat.

The eggs, laid in the alveoli and parenchymatous tissue of the ungs, hatch *in situ*, and the larvæ migrate up the trachea, and are

swallowed and pass out with the fæces. From the time of hatching until the time that they leave the body in the fæces, no apparent change in morphology takes place.

The larvæ have been allowed to hatch in the dead body of the female *Aelurostrongylus*, so that there is no possibility of this being the larval stage of any other species of worms.

The larva is about 0·36 mm. long and 0·015 mm. broad (Plate 3). The mouth opening is simple and is surrounded by six low papillæ. The cuticle is covered with very fine transverse striations and a double lateral line is seen, suggesting that the first larval stage is omitted in this species.



Elurostrongylus abstrusus. Plate 3.—Ovum and larva as found in the lungs and intestine of a cat, showing the variation in tail form.

The œsophagus is 0·14 mm. long and has a central, as well as a posterior, swelling. The anterior part of the œsophagus, terminating at the central bulb, is largely muscular; the posterior portion is distinctly glandular. The anterior swelling has a diameter of about 0·006 mm., the posterior swelling, about 0·01 mm., and the narrow part, 0·003 mm.

The œsophagus communicates with the mouth opening by means of a cuticular buccal tube which seems to be continuous with the œsophageal lumen. This tube is dilated centrally, but converges slightly towards its anterior junction with the inflexed cuticle.

The intestine is very granular and measures about 0·19 mm. in length. It is connected with the anus by means of a short cuticular rectum. Just posterior to the anus is a small protuberance which is inconstant in size, but is always present. The anus is about 0·03 mm. from the tip of the tail.

The tail is very characteristic and carries an undulating appendix and normally a dorsal projection: these vary very considerably in size and relative position.

Biology of the Larva.

Although larvæ are numerous in the intestinal contents, it was found more convenient to collect them from the lungs. An infected lung was minced, and after mixture with water, the fluid was strained into a centrifuge tube. The precipitate consisted of small particles of lung tissue from which the larvæ could be easily isolated in pure culture.

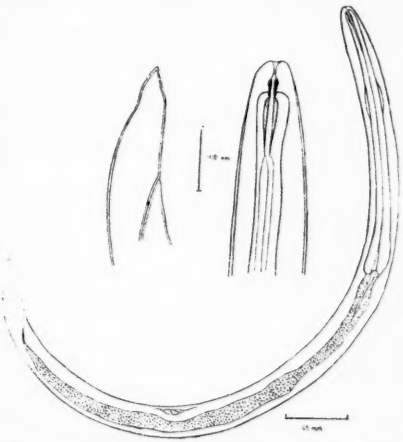
The larvæ are very active when isolated on a slide from the lung or intestinal contents, and, when collected in water, they still retain their activity. They normally move about with an undulating movement, but in a fluid medium make very little forward progress. In mucoid fæcal material, however, they do progress slightly. They do not appear to climb from fæcal cultures in Petri-dishes as so many of the Strongyle larvæ do.

Skin Penetration.—A number of larvæ were collected in a small drop of water and tested for skin penetration by means of the Goodey "Floating Raft" technique, the skin of a young rat being used. The larvæ moved actively on the surface of the skin, but made no attempt to penetrate it. After the drop of water had evaporated the surface of the skin was covered with egg albumen and when this had dried, the skin was fixed, and serial sections cut. The larvæ could be seen on the surface and none had attempted to penetrate the skin. The saline used for floating the raft was centrifuged, but no trace of larvæ could be discovered. This experiment was repeated with larvæ from the fæces (collected by straining, and decanting and centrifuging) varying in age from one to eight days. In all cases, no larvæ were found to penetrate the skin, and it appears legitimate to conclude from this series of experiments that the larvæ are not skin penetrators.

Duration of Life.—The larvæ do not seem to be able to live in the free state for over a fortnight—the longest period for which the writer could keep them alive in water being 11 days. They appeared to die even earlier in fæces. During their period of free life only degenerative changes were observed, and in no case did they show any sign of further evolution.

Feeding Experiments with Mice.—Following the example of Leuckart, these larvæ were fed to a number of tame white mice bred in captivity. All the mice were obtained from the same source originally, although later some were bred in the laboratory. In all 46 mice were infected, but owing to outbreaks of sarcosporidiosis and of Rat Bite Fever, a number died before the experiments were completed. Of the remainder, 11 were examined and were found to have developed cysts, while 14 were destroyed at various dates after infection and preserved pending further investigations. Six mice

were found to be negative, so far as could be seen. All these experiments were fully controlled by keeping mice of the same origin and age, uninfected with larvæ of *Aelurostrongylus:* in none of these was any extra-intestinal parasite ever found. In this way, 21 control mice were examined. Mice were fed in batches: (*a*) by feeding on infected embryo-bearing lungs; or (*b*) by feeding with larvæ isolated from lungs or intestine or stomach placed on moistened biscuit or bread. Care was taken to see that all the material was eaten, but it was not possible to say if every mouse in every batch had swallowed larvæ. It is, therefore, impossible to say whether the six negative results recorded above were due to not being infected, or were slight infections overlooked, or were really failures. Sufficient positives were obtained, however, to make it certain that the larvæ described below are really further stages in the development of *Aelurostrongylus*.



Æ lurostrongylus abstrusus. Plate 4.—Larva found encysted in the mouse.

The Infective Larva.

It was found that the most convenient way to find if a mouse was infected was to pin the animal on a board with its abdominal surface upward. The skin was then reflected from the inner surface of a hind leg and the underlying areolar tissue examined. The worm-containing cysts were often visible to the naked eye, as "bubbles" lying superficial to the muscles of the leg. Whether so visible or not, a piece of this tissue was removed with curved scissors and placed between two slides and examined microscopically. In this way material was obtained for the following description. If the mouse proved to be infected the remainder was fed to a kitten.

The cysts are about 0·3 mm. in diameter, and have a thin fibrous wall. They are filled with a yellow granular or caseous material in the centre of which the larva is seen coiled on itself.

When removed from the cyst the larva is found to be 0·725 mm. long (Plate 4) and about 0·025 mm. in thickness. It is finely striated transversely. The œsophagus is now 0·2 mm. long, *i.e.* the ratio

of the length of the œsophagus to the body length is 1 : 3·5 ; whereas in the earlier larva it is about 1 : 2·5. The central bulb has disappeared and the posterior bulb is relatively smaller. The whole œsophagus is much more muscular and less granular than in the previous stage.

The mouth is a simple pore communicating with the œsophagus by means of a cuticular buccal tube. The buccal tube consists of a more highly cuticularised anterior portion, and a less highly cuticularised posterior portion which communicates directly with the lumen of the œsophagus. The anterior portion has a small number of rugæ on its exterior surface, while the interior surface is smooth.

The intestine is about 0·35 mm. long and is very granular. It communicates with the anus by means of a straight rectum about 0·02 mm. long. The anus is situated about 0·04 mm. from the tip of the tail.

The tail is bluntly pointed. Towards its tip, the body narrows rather suddenly and the posterior portion is surrounded by deep striations which give it a serrated appearance. There is now no trace of the undulating appendix seen in the previous stage (Plate 3).

Experiments on Cats.

The experimental work on cats fell into two groups : (*a*) feeding with free larvæ from other cats ; and (*b*) feeding with encysted larvæ from mice.

(*a*) Four cats were fed on various dates with the larvæ isolated from the lung tissue and from the intestine. The first two were fed from street infections which were contaminated with *Ollulanus tricuspis*. In these two animals the infection with the latter parasite was demonstrated on *post-mortem* examination, but in all four no evidence of *Aelurostrongylus* could be seen.

(*b*) Seven animals were fed at various dates with mice which contained encysted larvæ as described above. Two of these animals died from distemper shortly after infection, and no evidence of lung infection could be seen. In the other five, however, *Aelurostrongylus* was found in the lungs.

Habitat.

The exact habitat of the adults has never been described. There are four possible localities in the lungs where parasitic worms can live : in the bronchi or bronchioles ; in the alveoli ; in the interstitial tissue ; or finally, in the blood vessels of the lung.

During a study of the lesions provoked by this parasite in the lungs of the cat, one was struck by two peculiar facts. Firstly, adults were never seen in several hundreds of sections examined, although

eggs and larvæ were plentiful. The adults were only found in teased specimens. (The sections were mainly prepared from marginal portions of the lung.) Secondly, the eggs in varying stages of development were evenly distributed throughout the lung and were not isolated in any particular area.

These facts suggested the possibility of a blood distribution of the eggs, and the blood stream as the normal habitat of the adults.

An infection in a kitten was diagnosed by the presence of the characteristic larvæ in the fæces. The vessels between the heart and the lung were then ligatured close to each of these organs, but without in any way interfering with them. The ligatured portion of the vessels was then removed, opened in saline and the contents shaken out. Fully adult male and female specimens of *Aelurostrongylus* were found in these vessels. The lung itself was then removed from the body, and still other adults were recovered in the larger branches of the pulmonary vessels.

Although there are many essential details of the life history of *Aelurostrongylus abstrusus* still remaining to be elucidated—more especially the development of the larva in the mouse and the development of the adult in the cat—it may be stated that the essential outline of its life history is as follows :—

The adult parasites become mature in the pulmonary vessels, and the female deposits her large, thin-shelled eggs in the blood stream. They are mechanically carried to the capillaries of the lung, where their progress is arrested, and where the unsegmented ovum develops into the characteristic larva. When mature, the larvæ force their way through the thin-walled tissue into the alveoli, and in this way reach the exterior after traversing the bronchioles, bronchi, trachea and alimentary tract. Occasionally in very young animals and with very heavy infections, the eggs themselves rupture the capillaries and, escaping in an undeveloped condition into the alveoli, then continue their development.

The fæces are eaten by mice and the larva migrates to various situations among the muscles and in the subcutaneous tissue, where, within three weeks, it assumes an infective, encysted form. It may remain viable for at least a year in this situation. If the mouse is now eaten by a cat, the larva escapes from the cyst and, reaching the lungs, within six weeks becomes a mature egg-laying adult.

While the present writer has never seen larvæ outside of the respiratory or alimentary tracts, Leuckart has described them from various parts of the body. Leuckart believed that he was dealing with the larvæ of *Ollulanus*, but in that he was undoubtedly mistaken.

His infections were, unknown to him, mixed ones, of both the lung and the stomach forms.

Recently, Professor Leiper has been conducting a series of experiments with *Trichinella spiralis*, and he was struck with the unusual appearance of the cysts in cats caused by the larva of this species. Instead of the usual lemon-shaped cyst so characteristic of mice and pigs, the cyst was almost spherical, although the infection was originally from rats with " normal " cysts. This is obviously because the host reaction in the cat (and examination of cysts from other carnivores, showed that it is probably a group reaction) differs from that of the rodent or the pig, and is not due to there being present a different species of *Trichinella*. These cysts measure about 0·2 mm. in diameter and correspond to Leuckart's description, except that the cyst wall is not so thick. As rodents are naturally eaten by cats, it is possible that Leuckart's animal in addition to suffering from *Aelurostrongylus* and *Ollulanus*, also suffered from a *Trichinella* infection ; but their distribution does not lend support to this hypothesis, as they occurred in situations where *Trichinella* larvæ rarely are found. From the above discussion, it would seem more probable that they were larvæ which had—either as ova or larvæ—passed *through* the pulmonary capillary network and so been carried to the various organs by the blood stream. The encystment would be the natural reaction of the host tissues to any foreign body.

The geographical distribution of *Aelurostrongylus abstrusus* is incompletely known. It has been reported from Germany, France, and from Northern Italy and Switzerland. It has not previously been recorded from Britain, but there is little doubt that the forms seen by Cobbold and Stirling should be referred to this species.

Ollulanus tricuspis, the Stomach-Worm of the Cat.

The adult worms live on the surface of the stomach and in the acini of the stomach glands. In very heavy infections, they may even be found in the first inch of the duodenum, but they have never been found beyond the duodenal flexure. This is analogous to the state of affairs seen in other stomach worms in other animals. Their presence on the surface of the gastric mucosa causes the production of a thick glairy mucus which assists in keeping them in position. They appear to be very lethargic in their movements.

In the fresh state the parasites are colourless, and are generally found with the head end coiled on itself. They are very minute, the male measuring only ·7 to ·8 mm. in length, with an average breadth of ·035 mm. ; while the female is ·8 to 1 mm. long, and about ·04 mm. broad.

XUM

The cuticle is faintly striated transversely and more conspicuously striated longitudinally.

THE ANTERIOR EXTREMITY.—A small buccal cavity is present containing no teeth, cutting plates, or similar structures. The cavity is formed by a reflection of the cuticle, and in optical section is almost spherical (Plate 6). The lateral diameter is ·004 mm., and its antero-posterior diameter is ·005 mm.

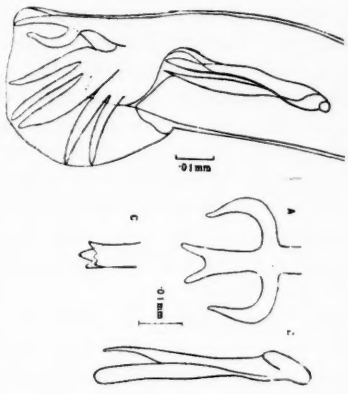


Plate 5.—*Ollulanus tricuspis*. Tail of male *Ollulanus tricuspis*. (a) Dorsal ray of male bursa, (b) Spicule, (c) tail of female.

The œsophagus, which is about ·2 mm. long, is only slightly swollen posteriorly. The œsophageal muscles are poorly developed.

THE MALE.—The bursa (Plate 5) is undivided, and is open only on the ventral side.

The spicules are equal in length (about ·05 mm.) and are bifurcated, one bifurcation being sharp and the other rounded. There is no accessory piece.

THE FEMALE. — The vulva (Plate 6) is a prominent structure situated in the posterior region of the body, which it divides in the ratio of approximately five to one.

The vulva opens into a short vagina, which is continued anteriorly as a single uterus. The junction of uterus and vagina is surrounded by a granular mass in the immature female.

This disappears in the mature female. There is no ovejector. The single ovary originates about the level of the œsophageal bulb, and insensibly joins the uterus: the ova are very large and granular. As the worm becomes older, the ovary becomes confined to the anterior part of the body, the remainder of which is occupied by the

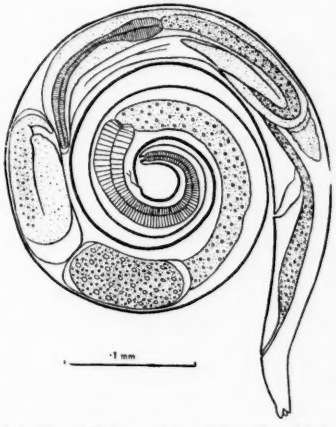


Plate 6.—*Ollulanus tricuspis*. Gravid female showing egg, developing first stage larva and developed first stage larva. A second stage larva was also removed by dissection from this specimen, but it is not shown in the drawing.

intestine and one to three very large larvæ (·3 to ·35 mm. long). The anus is situated about ·03 to ·04 mm. from the posterior end.

The tip of the tail has typically three " cusps " or teeth ; but occasionally one or two small extra cusps are found.

General Evolution.—The large granular egg formed in the single uterus gradually develops into a larva, which escapes from the thin eggshell, and subsequently moults—still inside the female—resulting in a form with tricuspid tail. The next stage seen is free in the stomach of the cat. Finally, also free in the stomach, is found a stage comparable with the fourth stage larva of the other Strongyles. The sheath of this form, in both sexes, carries a typical tricuspid tail.

All the forms found free in the stomach of the cat—except the adult male—possess a typical tricuspid tail and bear no resemblance whatever to the larva of *Aelurostrongylus abstrusus*.

The First Larval Stage.—This form is first seen inside the distended egg-shell (Plate 7), but ultimately comes to lie free in the uterus of the female. The description of this and the next stage has been prepared from specimens dissected from the uterus of gravid females.

This larva differs from all subsequent stages in possessing a round blunt tail. It is 0·35 mm. long and about 0·002 mm. in thickness. The mouth opening is a simple pore, apparently not surrounded by circumoral papillæ. A distinct buccal tube, somewhat dilated centrally, connects the mouth pore with the œsophagus. The œsophagus is about 0·125 mm. long and is of the usual type seen in young strongyle larvæ, i.e. it has a posterior bulb (0·013 mm. in width) joined by a constriction to an interior swollen portion (0·01 mm. wide).

This stage is later seen to become " vacuolated " at both ends and at the posterior end the tricuspid tail of the next stage may be seen in process of formation.

The Second Larval Stage.—This form is about 0·34 mm. long and has a typical tricuspid tail. The cuticle is finely striated transversely. The mouth opening is a simple pore which communicates with a buccal tube which is cuticularised and is reinforced *anteriorly* with a cuticular ring. It communicates with an œsophagus which is similar in shape to that seen in the first stage and which measures 0·13 mm. in length. The intestine is very granular and measures 0·16 mm. in length. It communicates by means of a short rectal tube with the anus which is situated about 0·03 mm. from the tip of the tricuspid tail.

The next stage to be described has always been found free in the stomach, but forms apparently similar but measuring 0·4 mm. in

length with an œsophagus 0·0125 mm. long, have been dissected from gravid females.

THIRD STAGE LARVA.—This form measures 0·5 mm. in length with a width of about 0·022 mm. The skin is finely striated. The mouth opening is simple, but it communicates with a V-shaped buccal cavity, the straight sides of which are cuticularised. The œsophagus which still has a slight constriction, is 0·15 mm. long with a maximum width of 0·012 mm. The intestine is very granular

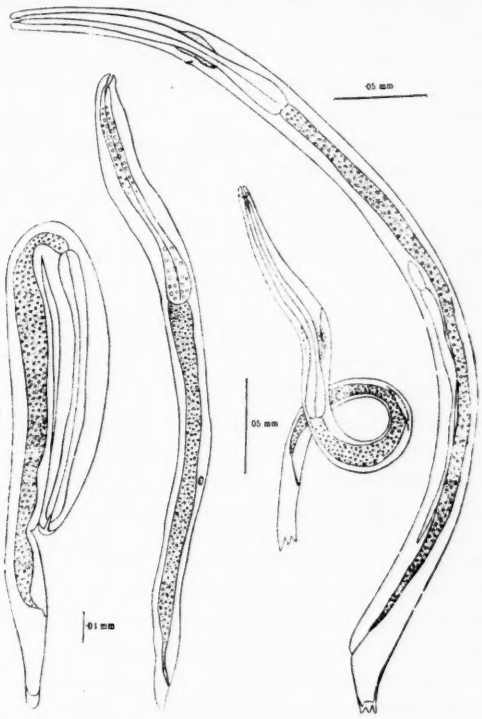


Plate 7 (left to right).—Developing first stage larva : fully developed first stage second stage ; third or infective stage.

and measures 0·35 mm. in length. Towards the posterior portion of the intestine, and running parallel with it, is seen the elongated genital rudiment. There is, of course, still no trace of a genital opening. The anus is 0·03 mm. from the tip of the tricuspid tail.

This form, unlike the adults, usually lies curved like an arc, and is found, not only in the same position as the adults, but free in the cavity of the stomach.

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THE FOURTH STAGE LARVA.—These are usually found on the surface of the mucosa of the stomach. The sexes are distinct.

The female is 0·625 mm. long and the œsophagus is 1·4 mm. to 1·6 mm. long, and claviform in shape. The intestine resembles the adult intestine. The mouth opening, in all the specimens observed is undergoing change and the temporary buccal capsule is being replaced by a new one on the anterior end of the œsophagus. The ovary is present as a long tube running forward to almost the level of the beginning of the intestine. Posteriorly it becomes vacuolated and joins a vulva, which does not yet communicate with the exterior. The anus is present in its final position and is joined to the anal opening of the larval sheath. The sheath and body have the typical tricuspid tail.

The male is about 0·65 mm. long. The digestive system is similar to that seen in the female. The male genital tube is present as a solid mass running forward from the cloaca, which it appears to join. The bursa has assumed its final form and spicules and accessory piece are present. The larval sheath is swollen posteriorly, but contracts at its extreme tip to form a tricuspid appendix.

The Biology of Ollulanus.

Early in the experimental work, it was found to be comparatively easy to produce a stock infection in cats by transferring the fresh stomach contents of an infected animal to an uninfected kitten by feeding. The question of the natural exit of the parasite was, however, not solved by these experiments. In most animals only two normal routes whereby a parasite may leave the stomach can be found: (*a*) by passage with the fæces to the exterior; or (*b*) by remaining in the stomach till after death, when it would be eaten by some intermediate host or even by a definitive host.

Repeated search of the intestinal tract of all the infected cats in this series of experiments failed to reveal any trace of Ollulanus larvæ, and the first route did not seem to be the normal one in this case. Experiments with mice, fed not only on the stomach, but on the intestinal contents, were also uniformly negative.

In the cat a third possible route may be considered, viz. by emesis. The cat is able to vomit with such facility, and it does so with such regularity—often eating grass to cause emesis—that the action might almost be called a normal one. The parasite, moreover, causes an inflammatory or a catarrhal condition of the gastric mucosa, and emesis, therefore, would be a natural sequal to this infection. Moreover, cats will readily eat the vomit of other cats, especially if they are hungry, and all natural infections of this parasite which I have

seen, have occurred in stray, badly-fed animals. Accordingly it was decided to test the possibilities of this route.

A cat was infected by feeding on an ollulanised stomach, and a few months later was injected subcutaneously with apomorphine (in preference to an oral emetic which might have affected the parasite). The animal vomited in a few minutes, and a rapid examination of the vomit showed the presence of the third stage larva. The mass was placed before a kitten, which readily ate it. When this animal was destroyed a few months later, it was found to be heavily infected with Ollulanus.

This suggests that infection may be produced by direct feeding of the vomit of an infected animal.

Another cat was placed in the same cage as the first, which was observed to vomit occasionally, and it was given the opportunity of eating the vomited material. When it was destroyed some months later, it also was found to have acquired the parasite.

Accordingly it seems probable that emesis is at least one method of conveying the infection from one animal to another, and although it is not claimed that this is the only method, so far no other is apparent.

A fourth cat was infected with 10 larvæ—similar to those observed in the vomit—and when destroyed six months later, was found to have a very heavy infection of fourth stage larvæ and adults of *Ollulanus*. During this period it had been enclosed in a cage by itself and could not possibly have been infected from outside. It seems extremely probable that this is due to continuous auto-infection from the animal's own vomit.

At the same time, it is not possible to exclude entirely the continuous development of the parasite within the host, especially when it is considered that only a very short time need necessarily elapse between the emission of the larvæ in the vomit and their ingestion by another host. In most other parasites a " time factor " outside the body of the definitive host is involved, and this seems to be wholly or partly absent in the case of *Ollulanus*. This parasite differs in several important respects from other parasites, not only in its peculiar habitat, but in being viviparous, and in the larvæ completing their preliminary moults within the uterus of the female. It is accordingly not safe to generalise on analogy from other forms having different biological characters. Fülleborn has recently studied *Rhabditis bufonis*, a parasite of the lung of the frog, and he suggests that in this form some substance is produced which would inhibit the continuous development in the lungs. It is possible that such a substance is also produced in this form or otherwise there would be infections even higher than those observed. Or it might be that this substance would only be produced after an optimum concentration of adults in the stomach had been reached.

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It is not possible either to prove or disprove either of these hypotheses at the present moment, and this cannot be done until all possibility of continuous auto-infection can be eliminated.

The development of the parasite inside the stomach has not yet been elucidated, but serial sections of parts of the stomach of several infected cats suggest the possibility of a development *in* the mucosa.

CONTROLS.—All the cats used in these experiments were obtained as kittens three to four months old from the same source. At the same time about twice this number was obtained for other experiments, and these animals were used to control the Ollulanus experiments. In no case was this parasite found in any of the control animals, and this makes it practically certain that the experimental cats were free from Ollulanus when fed. Thereafter they were confined to cages and accidental infection from outside sources rendered impossible.

The present conception of the life history of *Ollulanus tricuspis* is as follows. The egg hatches in the uterus and the larva which emerges moults *in situ* and its tail changes from a rounded to a typical tricuspid one. The second stage larva develops into a third stage which is found outside the female, but the exact period at which it leaves the mother is still unknown. This form leaves the stomach in the vomit and is swallowed by a new host, in which it develops into a fourth stage larva and finally the typical adult. Some part of this development seems to take place in the depths of the mucous membrane above the muscularis mucosa. It is possible that there are other methods whereby the infective larva may leave the host, but these have not yet been discovered.

The geographical distribution of *Ollulanus tricuspis* is not fully known. It was found in Germany by Leuckart and in Switzerland by Galli-Valerio. Cobbold also reported it from Britain, but there is no clear evidence that he ever actually saw this species, and probably his record should apply to *Aelurostrongylus abstrusus*. Hall records its presence from Washington, D.C., but it is not stated whether he is referring to the adult in the cat or the larva in the mouse. In the latter case, his record would, of course, refer to Müller's species. Neumann reports that, although he searched very carefully for Ollulanus in France, he was unable to find it.

The morphological and biological studies described in this article have occupied several years, and results have been published in a number of papers in the *Journal of Helminthology*. These papers are listed below and contain full accounts of the experiments together with references to all the previous publications.

Jl. Helm. I, 1923, 157-160.
,, IV, 1926, 53-60.
,, V, 1927, 1-24.
Jl. Helm. V, 1927, 55-66.
,, V, 1927, 67-80.
,, VI, 1928, 165-166.

The illustrations are reduced from plates in these articles by kind permission of the Editor of the *Journal of Helminthology*.

Clinical Articles

The Treatment of Persistent Nasal Catarrh in Horses by Means of Autogenous Vaccines.

By MAJOR A. A. PRYER, D.S.O., R.A.V.C.,
Royal Army Veterinary School, Aldershot.

THE preparation of autogenous vaccines, for the relief of persistent nasal catarrh in horses, has been carried on as a routine procedure at the Royal Army Veterinary School, Aldershot, for six and a half years.

The results obtained from September, 1922, to September, 1926, have been published by Lawrence in the *Veterinary Record* of November 10th, 1923, and by Davenport in the VETERINARY JOURNAL for February, 1927.

Davenport proceeded on foreign service in September, 1927, at a time when the records of many cases, treated with vaccines of his manufacture, were outstanding and consequently he was unable to carry out a scrutiny of the results obtained. Therefore it is to the author that the task has fallen of summarising these results, together with those secured with vaccines prepared since Davenport's departure.

During the period September 21st, 1926, to December 31st, 1928, 75 vaccines were prepared; no essential alteration has been made in the mode of preparation and administration described in Davenport's article referred to above.

The bacteriological findings show some variation, in that streptococci, either pure or in assocation with other organisms, were recovered in only 29 per cent. of cases instead of the 65 per cent. of cases recorded by Davenport.

This may be attributable to the fact that the bulk of Davenport's cases occurred at a remount depot and many of them were probably cases of atypical strangles.

The present series of cases were distributed over many different military stations and only in a few of them was the affliction clinically suggestive of a strangles infection.

It has been noticed further that in those cases in which streptococci were present, and were incorporated in the vaccine, the results obtained were uniformly inferior to those secured with vaccines prepared from swabs in which streptococci were not detected. The author has been struck so forcibly by this fact that he has come to regard the finding of streptococci, either when examining microscopically a smear made from the primary swab, or when recovering them in culture, as an

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indication that vaccine therapy will not be attended by the same degree of success that has been found to follow the employment of vaccines from which they are absent. It appears possible that there may be some connection between this finding and the well-known difficulty of evoking an immunity response to the various strains of streptococci recovered from cases of strangles.

The following is a summary of the organisms which were isolated from the swabs and which were incorporated in the vaccines :—

Staphylococci in association with diplococci	in 25 per cent. of cases.
„ „ „ streptococci	„ 18 „ „ „
Staphylococci in association with diplococci and a small gram negative bacillus ..	„ 14 „ „ „
Staphylococci in association with diplococci and streptococci	„ 11 „ „ „
Staphylococci in association with a small Gram negative bacillus	„ 9 „ „ „
Staphylococci only	„ 7 „ „ „
Staphylococci in association with streptococci and a small gram negative bacillus	„ 5 „ „ „
Staphylococci in association with diplococci and a cocco bacillus	„ 4 „ „ „
Other combinations of the above-mentioned organisms	„ 7 „ „ „

The time and labour necessary for classifying, with precision, all the organisms encountered, has not been available, but the morphological and cultural characteristics observed showed considerable constancy throughout the series.

It is obviously impossible to claim that all the organisms recovered were pathogenic since an exhaustive investigation of the bacterial flora of the nasal chambers of the healthy horse would be an essential preliminary to any such assumption ; all that one can say is that their incorporation in vaccines yielded gratifying results.

Results.

In 58 of the 75 cases in which a vaccine was prepared, full particulars of the results obtained were returned to the laboratory ; in four cases the vaccine was not used owing to the patient having died or recovered before it was received ; in 13 cases the results of treatment were not communicated. Details of the 58 cases which were available to assess the value of the treatment are given in the " Appendix," and it is felt that they merit the following comments :—

(1) In 56 cases, cures, attributed to the vaccine, were reported by

veterinary officers working independently in different garrisons in the United Kingdom and Rhineland.

(2) Of the 56 cases treated successfully, two were reported as cured after the administration of two doses of vaccine. They had been under other treatment for 51 and 28 days respectively prior to the applications of vaccine therapy; the nasal discharge ceased and did not recur, in one case nine days and in the other cases 11 days, after administering the first dose of vaccine.

In four cases recovery occurred after giving three doses of vaccine; the subjects had been under treatment previously for 33, 56, 41 and 19 days respectively; corresponding recovery was reported at the 14th, 9th (in two cases) and 16th days after administering the first dose of vaccine.

(3) Of the 50 cases treated with the full course of four doses of vaccine:—

Thirty-six, or 72 per cent., recovered between 14 and 21 days with an average of just under 18 days. This is without regard to the number of days the cases had been under treatment prior to the application of vaccine therapy, varying as it did from 187 days to 13 days with an average of 55 days.

Fourteen, or 28 per cent., recovered between 22 and 44 days, with an average of 28 days; they had been under treatment previously for periods ranging from 135 days to 17 days with an average of 64 days.

The fact that recovery occurred in a high proportion of cases about the 18th day is reconcilable to the anti-body production that should follow the administration of four doses of an autogenous vaccine at intervals of four to five days.

As far as the remaining cases are concerned, i.e. those in which recovery did not occur until four or more weeks had elapsed, it may be contended that cure was attributable to natural forces rather than to the employment of the vaccine. Whilst it is difficult to refute such an assertion, mention must be made of the fact that in some of these cases the merits of the vaccine are displayed in a disadvantageous light owing to the varying interpretation used in determining the date cured. The most a vaccine can be expected to accomplish is the removal of the nasal discharge and associated symptoms; this was realised pretty generally and most of the records were compiled on this basis. It has been found, however, that in some cases the date on which the animal was shown as cured was not that on which the nasal discharge ceased, but that on which the patient was discharged to actual duty. Thus the utility of the vaccine has been rendered less apparent by the retention under treatment of patients for debility, etc., long after the vaccine had performed its legitimate task. Persistent

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nasal catarrh is encountered more frequently in Army horses than in those employed in other spheres and the problem of its cure is of chief interest to the military veterinarian. It is considered that sufficient evidence has been accumulated to indicate that the condition is usually removed more speedily by vaccine therapy than by other methods of treatment.

In conclusion, it may be said that whilst the relation between persistent nasal catarrh and defective wind is largely conjectural, it seems possible that the more prompt and more general application of vaccine treatment might be followed by a diminution of the number of animals which become ineffective from " roaring " and " whistling."

The acknowledgements of the author are due to Mr. J. D. G. Crisp, Senior Laboratory Assistant at the Royal Army Veterinary School, for much capable and painstaking work in connection with the preparation of the vaccines and the compilation of records.

Appendix.

1 Laboratory No.	2 Date Admitted to Hospital for Catarrh.	3 Date First Dose of Vaccine was given.	4 Date Discharged from Hospital Cured.	5 No. of Days Sick before Vaccine Treatment was given.	6 No. of Days Remaining in Hospital after First Dose of Vaccine was given.	7 No. of Doses of Vaccine Given.
1510	1-9-26	22-10-26	30-10-26	51	9	2
1513	14-10-26	29-10-26	16-12-26	15	19	4
1516	26-10-26	12-11-26	6-12-26	17	26	4
1533	28-10-26	2-12-26	19-12-26	34	18	4
1534	9-9-26	6-12-26	—	83	Failure	4
1538	15-10-26	13-12-26	27-12-26	59	15	4
1544	13-9-26	26-12-26	7-2-27	135	44	4
1550	22-11-26	20-1-27	6-2-27	59	18	4
1552	3-11-26	8-2-27	28-2-27	97	20	4
1556	20-12-26	1-2-27	24-2-27	43	24	4
1561	15-12-26	8-2-27	23-3-27	55	44	4
1570	5-1-27	11-2-27	28-2-27	37	18	4
1577	19-8-26	25-2-27	16-3-27	187	20	4
1606	22-11-26	16-3-27	7-4-27	114	23	4
1624	2-3-27	4-4-27	17-4-27	33	14	3
1740	15-3-27	27-5-27	15-6-27	73	20	4
1741	31-3-27	27-5-27	25-6-27	57	29	4
1757	27-4-27	31-5-27	13-6-27	34	14	4
1815	6-4-27	31-5-27	20-6-27	55	21	4
1875	25-4-27	1-6-27	15-6-27	48	15	4
1876	11-4-27	1-6-27	25-6-27	51	25	4

1 Laboratory No.	2 Date Admitted to Hospital for Catarrh.	3 Date First Dose of Vaccine was given.	4 Date Discharged from Hospital Cured.	5 No. of Days Sick before Vaccine Treatment was given.	6 No. of Days Remaining in Hospital after First Dose of Vaccine wasgiven.	7 No. of Doses of Vaccine Given.
1877	24-4-27	31-5-27	10-6-27	37	11	2
1973	23-5-27	20-6-27	5-7-27	28	16	4
2017	17-5-27	20-6-27	5-7-27	34	16	4
2077	25-2-27	8-7-27	25-7-27	67	18	4
2184	28-5-27	3-8-27	24-8-27	68	22	4
2186	24-5-27	28-8-27	31-8-27	70	29	4
2303	26-2-27	25-8-27	12-9-27	84	19	4
2349	8-7-27	5-9-27	22-9-27	59	18	4
2350	7-2-27	5-9-27	30-9-27	60	26	4
2351	2-6-27	5-9-27	22-9-27	96	18	4
2353	20-6-27	5-9-27	22-9-27	77	18	4
2354	21-7-27	5-9-27	22-9-27	46	17	4
2355	16-8-27	5-9-27	—	20	Failure	4
2380	20-7-27	22-9-27	5-10-27	64	14	4
2381	25-6-27	22-9-27	7-10-27	89	16	4
2382	22-7-27	22-9-27	5-10-27	62	14	4
2383	5-9-27	22-9-27	5-10-27	16	14	4
2396	27-7-27	22-9-27	30-9-27	56	9	3
2397	12-8-27	12-9-27	30-9-27	41	9	3
2502	17-8-27	10-10-27	24-10-27	54	15	4
2503	13-8-27	10-10-27	28-10-27	58	19	4
2619	20-8-27	9-11-27	28-11-27	20	20	4
2620	23-9-27	9-11-27	28-11-27	48	20	4
2621	22-9-27	9-11-27	30-11-27	48	22	4
2622	19-9-27	9-11-27	28-11-27	51	20	4
2927	8-12-27	20-12-27	8-1-28	13	20	4
2828	5-12-27	20-12-27	5-1-28	16	17	4
3021	20-12-27	26-1-28	14-2-28	37	20	4
3022	22-12-27	20-1-28	4-2-28	19	16	3
3403	10-5-28	10-7-28	4-8-28	61	26	4
3404	15-5-28	10-7-28	8-8-28	56	30	4
3514	2-7-28	6-9-28	25-9-28	66	20	4
3515	12-7-28	6-9-28	28-9-28	56	23	4
3526	19-7-28	11-9-28	27-9-28	54	17	4
3527	22-8-28	11-9-28	27-9-28	20	17	4
3543	17-7-28	28-9-28	17-10-28	73	20	4
3601	27-8-28	22-10-28	6-11-28	56	16	4

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Operation for the Cure of Inguinal Hernia in the Dog.

By R. HUDSON, F.R.C.V.S.,
Retford.

WHEN castrating of the animal may be carried out, the operation for the cure of inguinal hernia is a simple matter, but where the testicles are to be saved it becomes a much more difficult and serious problem.

The subject in this case was a Pekingese which had won many prizes and was valuable for stud purposes. Therefore, the owner was anxious that the testicles should be saved. To have castrated him would have rendered him ineligible for Shows.

He was about 15 months old and the hernia on one side formed a sac of the scrotum about two inches wide by four inches long, and the testicle could only be felt with difficulty. On the other side the hernia was not observed until some days after the previous side had been operated on, when it was found to fill out the neck of the sac for about one inch. It became much worse later on.

Operation No. 1.

It was intended to close the abdominal opening and to narrow the neck of the sac by sutures, leaving sufficient room for the spermatic artery and vas deferens. The inguinal opening was about three-quarters of an inch long and easily admitted my little finger.

After fasting for 24 hours, the patient was given one grain of morphia, and when sufficiently under its influence was placed on the operating table. The seat of the operation was prepared by washing, shaving, dressing with Tr. Iodine and about 20 minims of two and a half per cent. Solution of Cocain injected over the inguinal opening.

The hernia having been reduced an incision about one and a half inches long was made over the opening and dissection carried out until the neck of the sac was exposed, fat and connective tissue being removed. The wall of the sac was very thin, the spermatic artery and vas deferens being clearly seen through it.

The edges of the abdominal opening were very thin and ill-defined and to infold the wall of the sac and suture the edge of the ring presented considerable difficulty.

Intestines kept falling into the sac and they, along with the

spermatic artery and vas deferens, were always in danger of being included in the sutures.

However, I managed to place five or six sutures and hoped for the best.

The cavity was swabbed out, the skin sutured and a dressing applied under a bandage.

On the fourth day the wound was found to be suppurating and some sutures were removed, the cavity being swabbed out and lightly packed; also, the other side was noticed to be bigger than normal in the neighbourhood of the inguinal ring.

In about 10 days the wound was almost healed, but a suspicious swelling began to appear at the site of operation, and the swelling on the other side increased.

It was evident that the operation had been a failure.

Second Operation.

The wound having practically healed and the underlying tissues become fairly elastic, the patient was prepared as before.

I had previously sutured the abdominal opening with a small curved needle, which was difficult to handle. I now had a small McEwan's needle which was much better to guide and work with.

On the operated side the neck of the sac was difficult to locate owing to newly-formed tissue and in the attempt I penetrated it and so had trouble with escaping intestines.

However, I managed to get my sutures into position better than in the first attempt and closed the abdominal opening more satisfactorily, leaving room for the artery and vas deferens. Sutures were also placed along the neck of the sac.

The other side was operated on in the same way, the only difference being that there was more fat and tissue over the inguinal opening.

In placing the skin sutures they were carried through underlying tissue where possible.

The wounds were dressed with Iodoform and Boracic Acid, and a pad of wool was held in position by a bandage.

The wounds healed without suppuration, except a small cavity at the end of one of them. This did not give much trouble.

After about a fortnight there was a suspicious swelling on one side, but the owner was advised to keep the wool and bandage applied for three or four weeks and lately, about three months after the operation, I hear that the patient is cured and being used for stud purposes.

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Crib Biting Operation.

By FRANK CHAMBERS, O.B.E., F.R.C.V.S.,
Wolverhampton.

On July 31st, 1928, in conjunction with Mr. K. Miles, M.R.C.V.S., I operated on a seven-year-old thoroughbred mare, "Carcavet" (by Sunbright ex Carbide). This mare was a very bad cribber, so much so that the owner could never get her into good condition. She ran third in an open race at a point-to-point in March, 1928. The owner stated that it was this lack of condition that stopped her from winning races. The mare was anæsthetised by the administration of two ounces of chloral hydrate into the jugular vein. The anæsthesia was not absolute, but it was rendered complete by the administration of a very small quantity of chloroform. The operation was carried out as originated by Prof. Forssell, but it was made difficult by the presence of much inflammatory tissue underneath the skin and around the muscles. This inflammatory exudate had been caused by the constant wearing of a leather strap around the neck.

A large amount of muscle from each individual belly was taken away and every one was dissected carefully out to its anterior attachment, and removed from this attachment. The hæmorrhage was not very great, but the subcutaneous vessels gave a certain amount of trouble. The wound healed by first intention and was completely closed and firm by August 12th. A small secondary abscess appeared on September 12th. This was evacuated and soon healed up. Conditioning commenced about the middle of August and she was hunted up to the date of sale. The owner in response to an inquiry about the mare writes as follows:—

"'Carcavet' cribbed from birth and her dam also cribs. She tried to crib the first time she was loose after the operation, but only once, as it apparently hurt her, so she never attempted it for several weeks, when for a period of a few days she again tried. It seemed to give her no satisfaction, so she gave it up entirely. She went lame with a ringbone and was subsequently sold to her breeder as cured of cribbing. That was at the end of November and as nothing has been heard it is obvious that she has not cribbed since sold. Anyway she completely gave it up in the middle of September until sold. She put on wonderful condition and looked as she never looked before."

Arsenical Poisoning.

By H. G. LAMONT, B.Sc., M.R.C.V.S.,
Ministry of Agriculture, Northern Ireland, Belfast.

In December, 1927, the writer was called upon to investigate a series of mysterious deaths which had occurred on a farm.

Two local veterinary surgeons concerned in the case supplied the following history of the "outbreak."

On December 24th the owner was driving a pony to the market when he noticed it was dull. The same night it developed acute diarrhœa and "loss of power" due either to paralysis or exhaustion. It died the following morning.

A heifer also became ill with similar symptoms on December 24th and died next day.

On December 25th a cow and a second heifer refused food, were straining and showed diarrhœa and marked weakness. These animals died on December 26th. *Post-mortem* examination of the cow by a local veterinarian revealed only a yellow coloration of the liver.

On December 26th a third heifer was off feed and was found dead at 11 a.m.

On December 27th two cows developed similar symptoms to the previous cases, one dying in 13 hours and the other in 36 hours. No rise in temperature was observed in any of the animals.

On December 29th the writer made a *post-mortem* examination of the two cows last mentioned.

The carcases were well nourished and showed externally evidence of diarrhœa and eversion of the anus. There was a slight suspicion of blood in the fæces. Anthrax was negatived by microscopical examination.

Similar lesions were observed in both cases. The mucous membrane of the abomasum was acutely inflamed and eroded, especially on the free margin of the folds. Ecchymoses and extravasations were present in the stomach and also in the small intestine which showed acute enteritis. A peculiar feature was that several feet of the small intestine would exhibit evidence of marked irritation, while the succeeding few feet would be comparatively free of inflammation.

The liver was of a yellowish colour, such as is associated with acute yellow atrophy. Small hæmorrhages were noted throughout the substance of this organ, and in the spleen and kidneys, which were in a state of fatty degeneration.

A diagnosis of acute irritant poisoning, probably arsenical, was made.

Inquiry revealed that all the animals had been watered from one

tank. While the owner admitted dipping sheep in this tank in September, he was emphatic that it had been carefully washed out. Examination of the tank by the writer, however, showed a sediment such as is seen with Cooper's dip.

A sample of the tank water and portions of the gastro-intestinal tract were submitted to an analyst, who reported that arsenic was present in all cases.

A baffling feature of the case was that animals had been watered from the tank from September to December without any ill-effect. It transpired afterwards that arsenic had been re-introduced into the tank by a careless servant boy who, before watering the pony, had washed in the tank a bucket containing some sheep dip.

None of the animals showed salivation or acute colic, as is usually seen in acute arsenical poisoning.

Translations

"La Maladie de Düren." Some Cases of Poisoning in Cattle of Obscure Origin but Usually Ascribed to the Ingestion of Harmful Foods.*

By PROFESSOR V. ROBIN,

Alfort Veterinary School, Paris.

CASES of poisoning in cattle, in which as yet little is known as to their etiology, appear to be more frequent at the present day than heretofore, and the author ascribes this tentatively to the use of greater quantities of industrial products and exotic plants. Such cases are difficult of study, as their clinical manifestation is complex, and chemical and experimental research is often at a loss to separate a specific poison or even establish its presence.

The author describes the more important outbreaks of such poisoning in recent years, and discusses the articles which have been devoted to them in veterinary literature.

He first deals with the "Maladie de Düren," so named after the original centre in which the outbreak was noticed, but which later spread to Holland, Belgium, and the west of Germany. All of the many observers agree that young animals and especially cows in milk are the most frequent victims. There seems to be little tendency for the disease to diffuse among the animals, and usually only one or

* Revue Générale de Medicine Vétérinaire. July, 1928.

two are ill at the same time, deaths succeeding each other at intervals of from three to ten days. On an average only 10 per cent. die in the same stables.

The symptoms vary slightly in different authors' accounts, but can be summarised as follows: The onset is often rapid, beginning with great diminution of appetite, muscular tremors, and a rectal temperature of 40-41° C. (104-106° F.); the animal is downcast, with signs of muscular weakness in some cases, and even paretic trouble. In a few hours there is considerable hæmorrhage from the nose, and this may sometimes be the first symptom observed; hæmorrhage then occurs elsewhere, the secretion of milk is reduced, and the milk is of a distinct pink colour. Finally, respiration is accelerated and difficult; the pulse weakens and becomes irregular, and the animal falls to the ground, dying usually within three days. Many hypotheses were put forward as to the cause of these deaths, and at first it was supposed that the trouble was of bacterial origin. Finally, however, thanks to the work of Lothes and Profé, the cause was found to be the feeding of soya meal, the symptoms being in every way similar to those described by Stockman in 1916.

After describing the apparently irregular way in which soya meal produces this illness, and the various explanations which have been proposed, the author goes on to show by means of examples that these are not the only cases of alimentary intoxication in which hæmorrhage has been observed.

Such, for instance, are the cases observed by Kerdiles in which the cause of similar hæmorrhage, etc., was fern (P-teris aquilina), and those reported by numerous observers and finally shown to be due to Ferula Communis.

Parasitic Toxæmia in Lambs. Acute Coccidiosis and Enzootic Paraplegia.*

By DR. H. CARRÉ,
Alfort Veterinary School, Paris.

With a few exceptions, affections depending directly on zoological parasites are chronic in nature.

Even considerable infestation, at least in the adult, seldom provokes violent reactions; local lesions are set up slowly and steadily, and the more or less apparent effect on the general health is attained progressively.

In the adult sheep, chronic parasitic infestations end usually in pronounced anæmia or cachexy (distomosis, strongylosis).

* *Bulletin de l'Académie Vétérinaire de France.* April, 1928.

The pathogenic function of parasites is admittedly multiple ; local irritant action, suppressing wholly or in part the functioning of an essential organ ; absorption of red corpuscles ; and toxic action, but difficult of control.

The cases which we describe are of quite a different type, and the sole reason of this difference lies in the youth of the infested animals.

Up to the present, coccidiosis in the sheep (Moussu and Marotel) is described as anæmia of slow development, often confused with the other parasitic affections, and found solely in animals at least a few months old and always after weaning.

Post-mortem examination reveals only the ordinary lesions of cachexy ; limpid non-inflammatory exudates are found.

The small intestine, the only part showing lesions, appears speckled with small whitish spots, easily visible by transparence, composed of collections of parasites.

This description is certainly exact, but is only applicable to animals of a certain age. In the frequent cases of coccidiosis I have met with, I have never been able to find the limited lesions described by Moussu and Marotel. My observations were carried out only on lambs one to two months old, and thus before being weaned.

In lambs coccidiosis takes on a special form, remarkable for the speed of evolution, peculiarity of the symptoms, the extent of the lesions, and finally by the abundance and exclusive presence of coccidia.

At the beginning of the infestation of the flock, when the lambs were from one to two months old, a few of them were found dead without any sign of illness being noticed. A long inspection of the lambs showed that some walked with difficulty and fell without being able to get up again. Simple palpation of the abdomen caused plaintive groaning. No diarrhœa, respiration 70-80 and discordant, tumultuous heart beats.

The animal remained stretched out a few hours with occasional movements ; a little frothy saliva appeared on the lips, and death ensued.

The skin being removed, the animal appeared normal ; no exudation, no lesion of the heart or lungs in spite of the intense symptoms.

The small intestine, on a more or less extended area, was pale, rosy or yellowish ; the vascular system was well defined at the region of the large curve. Taken between the fingers it gave an impression of fullness, and was firm and rigid.

Tularemia.

By M. A. MARTIN.

La Presse médicale in December last drew the attention of doctors to a disease transmissible to man by the wild rabbit. The *Centralblatt für Bakteriologie* published in January two articles dealing with an analogous affection but arising from the hare. Like observations have been made lately in America and Japan. Two cases in man have been observed in London. It will, therefore, not be without interest to devote a few lines to this question. The malady caused by the wild rabbit has been called "Tularemia," from the district of Tulare in California where it was discovered in 1912. It declares itself in man by fever 104° F., at first continuous, then with matutinal remissions, with a general grave condition, accompanied by local symptoms; inflammation of the lymphatic glands of the region which has been in contact with the affected animal (cubital and axillary most often); these are enlarged and slightly painful on pressure; suppuration of chaps or erosions on the hand or fingers. The evolution is long and while the sick person may get up at the end of eight or ten days, he remains weak and listless for six months or even a year. The glands only decrease in size very slowly and suppurate in half the cases; a narrow orifice forms whence pus flows, and its persistence may cause suspicion of tuberculous adenitis. Tularemia confers immunity to man; it is relatively benign and only few cases of death have been noted.

In the absence of information on the circumstances in which the illness has arisen, the doctor thinks of influenza, or typhoid fever, and later from the glandular reactions of syphilis, tuberculosis or plague. The man in Japan contaminated himself from wild rabbits at the end of autumn to beginning of spring. In America wild rabbits in a kind of underground caused the malady. The domestic rabbit escapes infection. In this country tularemia is transmitted from rabbit to rabbit by a tick and by the louse of this rodent. Experimentally it has been transmitted to the guinea-pig, white mice by the flea of the mouse, the lice and bed bugs. It is transmitted to man by the agency of biting flies, chiefly *Chrysops discalis*, by ticks and also—a curious point in this malady—by mammal contact of the blood or viscera of affected animals. In Japan this last method alone was noticed. The causal animals are sometimes ill or appear weak, but sometimes they are killed or shot, and show no ailment whatever.

Observations made with great care by Japanese doctors show without doubt that human contamination occurs through contact.

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A person may be affected a few days after skinning a rabbit ; several people may eat a rabbit without ailing, only those who skin or prepare it are affected. Sometimes the consumption of these animals occasions slight troubles. There is no need of apparent solution of continuity of the skin even for creating an easy way of access for the virus ; simple contact suffices and transcutaneous penetration is realised. A Japanese doctor, Ohara, had his wife affected, the back of the hand being rubbed with blood and serosity taken aseptically from a dead rabbit. In spite of a soaping of the region 20 minutes afterwards, the patient who submitted heroically to this experience, contracted tularemia and had to submit to surgical extirpation of the glands of the left armpit, which suppurated.

One can equally reproduce tularemia in a guinea-pig by soiling the skin with the fluid from an affected spleen, and cases have been observed, contracted at the laboratory under the form of typhoid without local lymphatic reactions, the naked hands having been contaminated from ailing autopsied animals.

The pathogenic agent of American tularemia is a small non-motile microbe, not taking Gram, the *Bacterium tularense*. It is inoculable to the rabbit, guinea-pig and white mouse, and probably transmissible in series. The two maladies, American and Japanese, have been proved experimentally to be identical. This malady seems to be epizootic in wild rabbits at times and every three, four or 10 years, in certain mountainous regions of Japan, these rodents die in large numbers.

* * *

Three Japanese savants, Professor Aoki and Doctors Kondo and Tazawa have studied a malady transmitted to man through a hare under the same conditions as tularemia ; but due to a filterable virus. It appears only to exist in the northern provinces of the Isle of Hondo and not in middle and southern Japan. In the northern regions the hunters know well of this human contamination from manipulation without care of hares killed, and declare that one must avoid touching the " white hypertrophied mass " of the hares, i.e. the glands. The blood is virulent. The virus of the hare appears capable of passing through the skin of the guinea-pig and probably the human skin. Two Japanese doctors were severely affected accidentally by manipulating organs and virulent tissues. The malady has been observed in hares which have been found in the forests weak and ill, and also in those preparing hares for the table, whilst those who have eaten the flesh remain unaffected. The symptoms of this malady in man are those of tularemia. What is the nature of the disease of hares ? Japanese authors know nothing of it, never having had affected subjects in hand.

The filtrable virus is inoculable to the rabbit, guinea-pig and rat. Guinea-pigs are very sensitive and die after having presented typical symptoms, fever, glandular hypertrophy. The rabbit is much more resistant and rarely dies. Here one observes high fever with or without enlarged glands. Rats always die. The virus is little resistant to heat (four days at 98·6° F.), but very resistant to cold.

Alimentary Polyneuritis in Young Dogs (Beri-Beri).*

By PROFESSOR J. POENARU,

of the Faculty of Veterinary Medicine of Bucharest.

POLYNEURITIS is better known in human medicine, and especially in countries where the population feeds almost entirely on decorticated rice, or in regions with a defective food system.

In veterinary medicine the only well-known cases are those studied experimentally by the feeding of decorticated cereals or sterilised food.

Eijkmann has observed polyneuritis in fowls following the use of decorticated rice ; and Fujitani in pigeons and parrots.

Shiga and Kusma, Schaumann, and Hoest, have studied polyneuritis in rabbits and guinea-pigs, and MacCullum, Funk, and Weil and Mouriquand, in mice.

Bergeon, by feeding dogs with decorticated rice, has provoked paralysis analogous to that of beri-beri.

Glyns, and Weil and Mouriquand, have shown that not only rice, but other cereals, such as barley or maize, if decorticated, produce in certain cases polyneuritis. For a lack of factor B or anti-beri-beri vitamin to occur, the food must be either very simple in kind, or else it must be too cooked or in bad condition.

During 1927 we were able to establish the presence of polyneuritis in two young dogs which had been weaned early and then fed on waste material which consisted largely of "mâmâliga," or decorticated maize meal boiled up. Symptoms of paralysis appeared 35 days after weaning. The puppies staggered as they walked, and finally, finding they could not walk they dragged themselves along on their stomachs. The muscles reacted to the electric current, but only in a weakly fashion. Parts of the body maintained their full reactivity, and in the limbs the sensitiveness diminished as the extremities were approached. Paralysis was symmetrical both in the fore and the hind limbs. The muscles of the face were normal, temperature normal

* *Bulletin de l'Académie Vétérinaire de France.* April 1928.

and appetite retained. The limbs were the only parts where functional trouble was noticed.

The first dog was two months old, and after being put on a diet of raw meat, milk and bread, was almost completely cured. Whereas its legs had been relaxed and remote from the body, it walked quite well at the age of four months, and ran and jumped; but, when walking, it not only rested on the sole of the foot, but on the metacarpals and metatarsus, i.e. on the whole foot.

The other puppy was destroyed when ill, and its nervous system was examined after being fixed with osmic acid. It was found that the extremities of the nerves of the foot muscles contained some degenerated nerve fibres.

I am therefore of the opinion that alimentary polyneuritis occurs frequently in puppies kept under defective hygienic conditions and with defective food, but that the trouble may be confused with other types of paralysis or with rachitism. Good food containing vitamin B effects a cure.

Discussion.

Dr. Mouquet said that during the past 10 years he had been drawing the attention of practitioners to the importance of qualitatively insufficient food in the genesis of various pathological conditions of obscure etiology. He pointed out that if the rations of the puppies under discussion were made up of the maize and kitchen refuse of little food value, it seemed probable to him that other deficiency troubles would have set in in addition to those which could be ascribed to a lack of vitamin B. For this reason he suggested that a better description would have been: "Deficiency disease combined with polyneuritis."

Ethyl Chloride as Anæsthetic for the Cat*

By DR. E. DECHAMBRE.

MANY of our colleagues hesitate to carry out small operations on the cat merely because it is an animal difficult and even dangerous to control. The lightest operation may become a source of dangerous wounds for the operator or his assistants. It is for that very reason, namely, that we have on several occasions had our assistants seriously wounded, that we decided to search for a practical method of intervention without danger either to the operator or the subject.

In spite of the cat's reputation of being unable to support anæsthesia easily, we thought that this was the most promising line of attack.

We were much struck by the medical statistics concerning

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anæsthesia with ethyl chloride, which show death to be exceptional (Seitz, among others, reporting 16,000 cases of its use, without a single fatality), and we tried to find out whether this product had not been tried in veterinary medicine. The most useful reference we found was in the vade-mecum of MM. Mollereau, Porcher, and Nicholas, where it is simply stated that, according to M. Auger, the use of ethyl chloride is the best method in the case of the cat.

But in practice we found serious difficulties, which made us understand why others had given up this method. *Indeed, it is indispensable that the gas be breathed almost pure, without admixture of air.*

The use of a mask is almost impossible in the case of the cat. The animal usually resists violently, and water vapour rapidly condenses on the compress, which soon becomes useless. It is practically impossible to obtain anæsthesia in this way.

The use of a box $60 \times 40 \times 40$ cm. ($24 \times 16 \times 16$ in.) did not put a cat to sleep with 50 grammes of ethyl chloride.

In order to reduce to a minimum the volume of air contained in the box around the cat, we constructed, after several experiments, a box of rather curious shape, but answering well to the object in view. It is a little longer than the body of a cat, and of trapezoidal section. Its front end is just big enough for the cat to introduce its head, and is closed by a sheet of glass thoroughly sealed to the box, with a small hole for the introduction of the ethyl chloride; the other end (by which the animal enters) is just big enough for the hind quarters of the cat, and can be closed by a door.

The animals can be easily placed in the box, as the way seeming clear, they enter readily enough, and once they are in in part, they cannot turn round. They are thus obliged to breathe in a very confined space, and anæsthesia is rapidly obtained with a few grammes of ethyl chloride (3 gr. are sometimes enough; 10 are a maximum).

Ethyl chloride is put up for sale in tubes with automatic opening, and shutting devices which allow them to be turned on and off instantaneously. Other models can be regulated to deliver the gas more or less rapidly. But anæsthesia is produced so rapidly that, at first, and until one is used to the method, it is preferable to use tubes which give off the gas slowly.

Anæsthesia takes place without any period of excitement or any danger of laryngo-reflex syncope; more or less pronounced purring marks the point where it is complete with muscular resolution. At that moment the animal is removed from the box and operated on rapidly. The duration of anæsthesia is short and the awakening very sudden. However, we have obtained eight minutes' complete anæsthesia on a healthy cat with 10 grammes of ethyl chloride. More-

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over, if the operation is on the hindquarters, the head can be left in the box, thus prolonging the period of anæsthesia.

Most minor operations can be carried out with this anæsthetic—castration of big cats, lancing of abscesses or hematomes of the ear, avulsion of teeth, even the eye, etc.

If the dose of anæsthetic is rather high, the respiratory movements may stop. As a rule they resume spontaneously in a few seconds. If they fail to do so, it is only necessary to introduce into the larynx an insufflation-tube and to provoke the laryngal reflex, when respiration is soon re-established.

Sometimes at the moment of awakening there are signs of excitement. For this reason it is prudent to allow the subject to come to in a large basket or cage. Care must be taken, however, that it be placed in such a way that respiration is not hindered. The animal returns to normal in a few minutes.

For several years we have regularly employed ethyl chloride in connection with the cat, and have operated on several hundreds without a single fatal accident. Some subjects have been put to sleep several times, either on the same day or several days running. One of them was treated 10 times in three months, sometimes after fasting and sometimes not. None of them died from the effects of anæsthesia.

In our opinion, with this method, ethyl chloride (which has long been recognised as harmless) will enter into current practice, and will allow our colleagues to carry out on the cat a number of operations which they had, with good cause, hesitated to undertake up to the present.

Clinical Studies on the Toxicity of Cyanogenetic Linseed Cake.

By DR. QUENTIN.

Bulletin de l'Académie Vétérinaire de France, May, 1928.

The clinical characteristics of poisoning by cyanogenetic linseed cake as observed in the sheep and ox are as follows :—

1. General effects of a more or less serious nature—

On the nervous system, trembling, sleepiness, stupor, weakness, staggering, fall.

On the respiratory system, special dyspnœa, with arrested breathing if the poisoning is acute, and with irregular acceleration of the breath in less acute cases.

On the digestive system, varying from simple to profuse and abundant diarrhœa.

2. Rapid appearance of symptoms after starting on a new lot of cake (usually eight or nine days after).

3. Return to normal by stopping the ration of suspected cake in cases where the trouble is checked before becoming very serious.

In advanced cases the well-known antidotes can be administered with advantage, namely, solutions of ferrous sulphate and sodium carbonate, officinal hydrogen peroxide diluted in five volumes of water, cobalt nitrate and (according to Drs. Richart and Brioux) sugar or treacle.

Post-mortem examination revealed stomachs normal except the fourth, which was of dark red colour, with very congested mucus and red liquid contents; the intestine was similar to the fourth stomach, the colon also containing blood clots, slight change in the liver, kidneys and pancreas; the lungs were very congested with reddish brown parenchyma and sub-pleural emphysema; heart normal with reddish endocardium speckled with hæmorrhagic spots.

As soon as this form of poisoning is suspected its diagnosis is easy. To confirm it a casual examination of the cake is insufficient, but resort must be made to chemical analysis. If prussic acid is found the cake should be sent to a chemical or toxicological laboratory for an estimation of the percentage of poison present.

All cakes containing more than 0·04 per cent. have been found to cause accidents. These are more or less serious according to the percentage of prussic acid in the cake and to the total amount of cake eaten. With regard to the latter it must be remembered that out of a herd some animals will eat a much larger quantity than others.

In addition to the factors affecting poisoning mentioned above the rate at which the cyanogenetic glucoside (linamarine) in the cake breaks down to prussic acid is of great importance, and since water, particularly tepid water, favours this formation of prussic acid, its use in the preparation of the ration should be noted. Finally it has been observed that soft cakes are the least dangerous, and that the hard and very hard led to serious trouble.

The author agrees with the conclusions of Dr. Kohn-Abrest (1920), that until manufacturers destroy the enzyme (linase) in the cake by superheating or steaming, a law should be passed prohibiting the sale of cake yielding more than 0·008 per cent. of prussic acid.

Dr. Drouin, in discussing the paper suggested that the increasing occurrence of linseed poisoning was due to the alteration in the sources of supply, the pre-war Russian supply being now made up with material from the tropics.

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Abstracts of Current Literature

Holstein, M. G.—A Case of Osteomalacia in the Dog.—*Bulletin de l'Académie Vétérinaire de France.* July, 1928, p. 288.

AFTER some general remarks on osteomalacia, the author remarks on the rarity of this malady in the dog and mentions cases which have been described in veterinary literature by Silling and Merny (1889), Morelli de Pise (1903), Hébrant and Antoine (1914), Liénaux and Huynen (1921).

A dog of the Groenendael breed, six months old, born in Belgium, sent to Paris at four months old, had been fed on soups, pastry and rice.

At the end of three weeks its owner noticed the dog to be weak, always lying about, mouth half open and eating with difficulty. The palate is tumefied and the face enlarged considerably.

At a clinical examination at the Alfort School the patient shows a deformed head, an enormous symmetrical swelling of the two maxillaries, the palatine arch much vaulted, the teeth displace outwardly and loose. The bones are soft and easily depressible. On the other hand, the bones of the body and limbs seem normal. Respiration is painful and very sonorous and death by asphyxia occurs in a few days.

The autopsy, apart from a cute nephritis only allows of finding alterations in the head bones. The bones are soft, can be cut with a knife, are transformed into fibrous tissue, greyish, elastic which fills up the sinuses and nasal cavities.

Histological examination shows the structure of osteosarcomas or ossifying sarcomas, there is no trace of calcareous salts, the osseous tissue is reduced to ossein, completely decalcified. One sees a fibroid tissue, some hæmorrhagic plaques.

The author diagnoses osteomalacia.

Monsieur Carougeau makes the following observations on the above. The author's interpretation would be indisputable if at the same time there had been lesions of the vertebral column and long bones. The integrity of these parts of the skeleton which in the horse are always affected with the bones of the head, leads to doubt and causes us to ask whether this is not a case of simple osteosarcoma.

[There seems to be little in current literature about osteomalacia in the dog. H. Gray, in Vol. II, Hoares System of Veterinary Medicine, p. 1331, considers it as not rare in the dog. Hutyra and Marek mention it as occurring naturally and being artificially produced.—G.M.]

Riedmuller, L., and Lutz, E.—Coccidiosis in Young Birds.—*Schwerzer Archiv. f. Tierheilkunde*, Vol. 70, 1928, pp. 22-32.

THIRTY-TWO naturally infected chicks were divided into five groups. Group I, untreated controls; Group II, treated with sour full milk put before them in place of drinking water; Group III received one-quarter per cent. solution of creolin 30 to 50 minims daily with a catheter direct into the crop; Group IV received milk and creolin; Group V, the most severely affected birds, received creolin. The effect of the treatment was judged by increase of weight and diminution of voided coccidia. Creolin proved unsatisfactory. Sour full milk gave the most favourable results, the birds treated gaining on an average 225g. more than the controls and after 42 days 315g. more. Hygienic measures must, however, accompany this therapy.

Theiler and Robinson.—Parabotulism of Horses.—*Revue générale de méd. Vétérinaire*, April, 1927.

PARABOTULISM of the equidæ is brought about by an organism of the parabotulin type, *Clostridium parabotulinus equi*, whose morphological characteristics and points of culture simulate those of *Parabotulinum bovis*, the causal agent of "Lamsiekte."

The malady which affects horses and mules commences suddenly with an apyretic attack of paralysis of the locomotor system. It generally terminates in 24 to 48 hours by death from asphyxia. Cure may result after several weeks. There is no characteristic lesion at the autopsy.

The microbe which is the cause of the disease has been isolated from the body of a rat found in the rack of a stable where mules had been stricken with paralysis. Colonies of the pathogenic agent were obtained in symbiosis with non-sporulated microbes—of coccus type—were transplanted on media of chopped meat, and put in a stove for three days to allow the anærobes to sporulate. A temperature of 70 degrees for an hour then makes the coccus disappear and one has a culture of fine flaky texture characteristic of *Parabotulinus*. This is an immobile bacillus, generally associated with another bacillus, sometimes with several others in chains; stains well with the basic aniline dyes and takes Gram when it is young. The toxin develops on culture medium at 37 degrees and also at an outside temperature of 20 to 26 degrees. This toxin injected into horses or administered by the mouth produces the malady. The mule and the ass also are very sensible to subcutaneous inoculation of the filtrate of cultures. In bovines the paralytic phenomena are also produced, but more slowly. In the sheep and the goat paralysis of the locomotor system

is the principle symptom of the experimental malady. The spontaneous malady appears to be due to the ingestion of diet soiled by the poison of the toxigenic agent. This is different from the microbe of the parabotulism of bovines. The two species of animals have not the same sensibility to the toxin and antitoxin of "Lamsiekte" and the one does not protect against the toxin of the parabotulism of equines.

Gurini, A.—Genital Tuberculosis of the Cow.—*La Clinica Veterinaria*, Oct., 1927, pp. 604-612.

G. EXAMINED 300 tuberculous cows at the abattoir of which 52 were affected with generalised tuberculosis. Amongst these latter six showed lesions of the ovaries of the Fallopian tubes and cornia; one showed lesions of the left tube and of the anterior part of the cornia of the same side; three presented lesions of the ovaries, tubes, cornia and body of the uterus and vagina.

Observations made and facts known point to the following conclusions:—

(*a*) Genital tuberculosis of cows is almost always of secondary origin.

(*b*) Tuberculosis by extension of the lesions of the peritoneum across the tubes is the usual form encountered.

(*c*) Ascending infection by *Tuberculous vaginitis* was not demonstrable, and it seems hardly possible. Only Bertolini records this fact, and under special conditions due to intermediary infection by the Malpighi-Gärtner canals.

Sablayrolles, L.—Contribution to the Study of Hæmorrhagic Gastro-Enteritis of Carnivora.—*Role of Spirillæ. Thesis Toulouse*, 1928. *Revue Veterinaire*. November, 1928. Pp. 632 and 633.

FOR some years, spirochætes, very widespread protozoa, have been observed by numerous authors in dogs affected with hæmorrhagic gastro-enteritis, to such an extent that certain men have looked on it as a spirochætosis. Researches by the author lead him to the conclusion that the etiology of typhus of the dog is still unknown, and that those best informed have cause to consider it as an auto-intoxication. In 12 sick subjects the parasites have never been discovered in the urine, kidney, liver and spleen, and it has never been possible to transmit the malady to dogs by giving them renal, hepatic, tissue, or pounded spleen and intestine.

On the other hand, S. has found spirillæ in the intestinal tract of healthy dogs in 50 per cent. of cases examined. He thinks that these spirillæ can proliferate largely in certain circumstances, become

pathogenic and cause a *spirillary dysentery* in the dog, a sporadic affection of long duration, characterised by hæmorrhagic enteritis, with resultant anæmia and progressive emaciation leading to cachexia and death. This malady, rebellious to various drugs, declines and is cured by doses of 75 centigrams to 1 gramme of stovarsol per day.

The author has published a certain number of observations collected in the clinical service of the veterinary school of Toulouse, produced in a clear and precise style and illustrated with perfectly plain photographs.

Cacciari, N.—Traumatic Gastritis Caused by a Willow Branch.—*La Clinica Veterinaria* 51, pages 127-128.

A SIX-MONTHS-OLD calf showed digestive disturbance, loss of appetite and irregular rumination. Examination showed temperature $103\frac{4}{5}$, meteorismus, faulty rumen movements, dejection and lassitude of the subject. After laxative treatment improvement occurred, yet in the neighbourhood of the xiphoid process of the sternum a round, fist-sized, warm, painful, doughy swelling appeared. After opening up a woody foreign body was felt in the abscess cavity. With the hand a blunt willow branch was drawn out. It was 10 inches long and quarter of an inch thick. In three weeks the fistula had healed up. After operation fever declined and normal digestion returned.

Kösler.—The Electric Stunning of Animals for Slaughter.—*Ztschr. f. Fleisch u Milchhyg*, 38, 16, pp. 284 to 285.

By use of the electric current used for lighting at 110 to 120 volts, a series of actual electric stunnings of cattle were carried out in the Stuttgart abattoir. As an electrode a large copper plate was used, which was laid on the damped loin region, and a brass tube was put in the mouth like a bit. After putting on the current the animal suddenly sank down on its knees and laid flat on its side. Immediately after knocking off the current complete unconsciousness was established. After two or three minutes consciousness returned. After putting on the current for a few seconds complete unconsciousness again occurred. At this stage the *coup de grâce* was administered without any restraint of the animal, and without any signs of pain on its part. The whole procedure was over in a few minutes. As opposed to hitherto slaughter according to ritual this method is markedly more simple, and results in a considerable saving of time, quite apart from the better impression it produces on the laity. It is to be hoped that the Jews will adopt this plan. Then the matter of the painfulness of the knife stroke method will be settled from the point of view of animal protection and humanity. The electro-technique is easy, handy and simple, and admits of the construction

of apparatus without danger to man. The obligatory use of this method of stunning animals has nothing objectionable in it.

Baxa, Dr.—Sexual Abuse of a Calf.—*Berliner Tierarzt Woch.*, Sept. 7th, 1928.

On March 11th of this year I was called to a near-by village to look at a calf which, according to the owner, was quite well the previous evening, the shed had been broken open in the night and the calf showed symptoms of illness from which the owner concluded it had been badly abused. The maid at two o'clock in the morning had seen two drunken fellows who knocked at her bedroom window and desired admittance, and after being refused, went away noisily. A connection was noted between these incidents. The first examination of the calf was made by me at 10 o'clock in the morning. The inspection showed a three-months-old well-developed female calf, pale grey, 90 cm. in height at the shoulder. The lively but troubled calf stood looking round at itself with arched back and tail stretched out straight from the body. The vulva is very severely swollen to about three times its normal size, and much inflamed. Distally from the ventral commissure of the vulva there is stasis œdema as large as a small apple. The mucosa of the vagina from the lips to as far in as could be seen shows extensive changes which are similar dorsally, ventrally, and laterally. It is very glistening, inflamed and swollen, its epithelium coloured mostly a dirty grey, and partly raised from its bed. On the first view of the vestibule of the vagina a few drops of a clear slightly bloody fluid escaped. No tears or wounds of the mucosa are present. The animal shows considerable pain on passing dung and urine. Appetite poor, but not lost. Digital examination per rectum only causes slight pain.

After this examination the diagnosis was "Inflammation of the external genitals and vagina brought about by the forcible effect of a blunt foreign body from without." Probably the evil-doer had made an effort to have thorough coition with the animal, which, from its size and the anatomical relations of the genital organs, was not impossible. Strict proof could not be got, as the clear, slightly bloody fluid, which could have been examined for human semen, flowed away on opening the vulva.

Prognosis is doubtful, as there may be a rent high up in the vagina. On this account antiseptic injections and Merck's carbon pencils were used. The calf gradually got better and had quite recovered by April 9th. The owner noticed on March 12th that the ears of the calf swelled greatly at the base, seeming to indicate that it had been

held by the ears whilst the evil deed was done. The vulva of the calf remained larger than before.

The gendarmes arrested two fellows on suspicion. One proved an alibi. The second was detained nine days for examination. He lied obstinately and for want of exact proof was finally liberated.

Reviews

How to Stain the Nervous System. A Laboratory Handbook for Students and Technicians. By J. ANDERSON, head laboratory assistant at the National Hospital (Queen's Square), for diseases of the nervous system. With an Introduction by J. G. GREENFIELD, B.Sc., M.D., F.R.C.P., Pathologist to the National Hospital, Edinburgh: E. & C. Livingstone, 1929. Price 5s.

AN interesting book of 137 pages, the subject being divided up into six chapters, an appendix and an index.

The book throughout its pages gives evidence of the skilled technician.

Chapter 1, in which the author deals with the removal, cutting and fixing of the brain and spinal cord, is very instructive and will be of great use to anatomical workers, as well as to pure laboratory workers.

His machine, which is illustrated, for slicing the brain, is especially interesting.

The methods of preparing Celloidin, paraffin and frozen sections are lucidly explained, and one notes that such essential details as microtomes and the attendant difficulties in connection with the knife are not neglected.

His views on stropping and honing are very instructive to one who has had experience of this bugbear, gall section cutting.

Many methods of staining are discussed, and the author's modifications given. His most important modification being the use of heat, in order to shorten staining time and give a better selective action.

Mr. Anderson has found calcium hypochlorite of value as an oxidising agent in the ripening of stains, and also in mordanting he favours chrome salts.

Pages 95-96 will be read with pleasure by all who have seen their work slip off the slide and go down the drain.

Chapter 5 deals in detail with some special methods for staining fat iron and calcium, as used by Dr. E. Weston Hurst at the National Hospital.

Pages 122, 123 and 124 contain some interesting details respecting the making of lantern slides.

The Appendix is devoted to the various formulæ used in histological work, and its twelve pages are full of details of great interest to student and expert.—J. McC.

Helminthology—Medical and Veterinary. By H. A. BAYLISS. Pp. xi+303. Size, 9½×6¾ inches. Figs. in text (200). London: Baillière, Tindall & Cox. Price 30s. net.

IN the preface to this work the author points out that the study of parasitic worms is a necessary part of the training of the veterinarian

and of the medical man who intends to practise in the tropics. The literature on the subject has grown enormously in recent years, but the available descriptions of many of the newly recognised species have been scattered through a vast amount of periodical literature, much of which is not readily accessible. The object of the author has been to collect this material under one cover and so assist the work of the student and practitioner by providing a textbook and book of reference. An attempt has been made to provide such short descriptions of genera and species as it is hoped, with the aid of the illustrations, may be found helpful in obtaining an approximate determination of most of the parasites with which one is likely to meet. The attempt has been highly successful and the work of the student of helminthology and of the busy laboratory worker who has much routine work to do is much simplified. The clinical aspect of helminthology is not dealt with.

One of the bugbears of students and clinicians for many years has been the constant changes in nomenclature. This difficulty is likely to be almost at an end, and in this work the author has adopted the names for parasites in accordance with a reasonable interpretation of the rules of the International Commission on Zoological Nomenclature. Owing to the international character of these rules the difficulties are less likely to occur in future, but there arises another difficulty for the busy clinician who may and frequently is unable to recognise an old and familiar friend in a new name. Many synonyms have been given and no doubt it is quite impossible to give anything like a complete list. For example, the veterinarian will look in vain for his old friends *Tænia marginata*, *Strongylus gracilis*, and *Strongylus armatus*. He will find, however, that his old friend *Strongylus tetracanthus* having passed through *Cylicostomum* (or *Cylichnostomum*) *tetracanthum* has now become *Trichonema* (or *Cylicostomum*) *ægyptiacum*, while *Trichonema arcuata* has disappeared.

The discovery of new genera is often liable to be disconcerting to the clinician. Over 30 species of the genus *Trichonema* have been described from the large intestine of members of the horse tribe, and it is a matter requiring considerable skill to separate many of them. "Since pure infections with a single species are practically unknown, and all presumably have similar habits and, when present in large numbers, similar pathological effects, the attempt to determine the forms present in any given infection is perhaps of somewhat academic interest." And so the clinician may indulge in a sigh of relief.

In addition to a very comprehensive general index there is also a most useful index to parasites of man and the principal domestic animals arranged under their hosts.

We welcome this work as a great boon to all students of helminthology. The descriptive text is most lucid and the figures wonderfully clear and demonstrative, and the whole make-up is quite up to the usual excellent standard of the house of Baillière, Tindall & Cox.—G.H.W.

Dogs. An illustrated handbook by LADY KITTY RITSON (Lady Kitty Vincent). Pp. 177. Chatto & Windus. Price 5s. nett.

EVERY veterinary student, and indeed every veterinary surgeon, ought to possess Lady Kitty Ritson's interesting little handbook on the Dog. It is written in the usual racy style by which this authoress knows so well how to fascinate the interest of her readers, and from start to finish

there is not an uninteresting paragraph. Every chapter is inspired by a writer who quite obviously knows the subject from A to Z, and the hints which are given are not only of practical service to the amateur breeder, but are equally of value to the veterinarian whose daily occupation keeps him amongst a canine clientèle.

There are 12 chapters, and these include amongst their headings "The Choice of a Breed," "The Rearing of the Puppy," and later on all about its weaning and the use of foster mothers. There are hints on training, hints on health, valuable advice about showing dogs, and a whole chapter is devoted to the subject of "Kennels and Their Expenses."

To commence to try and take paragraphs out of any of these chapters would be useless in a review such as this, because of the limited space which editors of scientific journals naturally allot for books of a lay character. The best thing that we can do for our readers is to advise them to get the book for themselves, and we are quite sure that once it is obtained it will be one of those which always lie handy for perusal on the waiting room table.

"In My Opinion"—Dissertations on Horses and Horsemanship by Various Authors. Edited by MAJOR W. E. LYON. Constable & Co. Pp. 308, fully illustrated. Price 31s. 6d. net.

MAJOR LYON is to be congratulated on bringing together in book form the methods adopted by present-day experts in the different aspects of horsemanship. Though the harness horse and pony are not considered, the scope of the book is large. The six parts, each division of which is contributed by an authority on this subject, cover The Evolution of the Horse, the Racehorse, the Hunter, the Hack and the Pony, with a final section on miscellaneous subjects; several of veterinary interest. The space allocated to each subject is of necessity limited, so that general principles only are outlined. This is as regrettable as it is inevitable, and the authors who have dealt with subjects such as the training of racehorses or hunters are to be admired for the masterly handling of their subject in so few pages. The article on the horse in portraiture is a pleasant and unusual inclusion. Of equal interest is the section devoted to the art of the "Haute Ecole" in Vienna. The illustrations, themselves contributed by experts amongst whom are A. J. Munnings and Lionel Edwards, are a notable asset to the work. Major Lyon has been eminently successful in editing a work invaluable alike to the amateur and expert, and with an instant appeal to the veterinarian; and those whose work or interest lies with horses should certainly find it a place on their bookshelves.

International Directory of Pedigree Stock Breeders. Price 25/- nett.

THE Vernon Press, under the editorship of Mr. R. de Toll, have compiled in the "International Directory of Pedigree Stock Breeders" a mass of information which is of the greatest service to anyone who is interested in the breeding and exportation of stock to any part of the world.

In a volume of some 820 pages, fully illustrated on art paper, one can find at a glance the names and addresses of the principal pedigree stock breeders and owners in every part of the world. To a veterinary surgeon in a breeding district it is an invaluable asset, and its influence extends from the different horse-breeding stables of civilised Europe to livestock

breeding in Samoa, Torres Straits Islands and every little civilised community from one end of the world to the other.

Green's Manual of Pathology and Morbid Anatomy. Revised by A. PINEY. 14th edition, pp. viii+650, 8 coloured plates, 261 text figs. London: Baillière, Tindall & Cox, 1928. Price, 21/- net.

THOUGH written for medical students of pathology, Dr. Green's book has been studied by many generations of veterinary students, who, on the appearance of the 14th edition, will pay tribute to the genius of its founder. Of this achievement the Editor of the *Jour. Path. and Bact.* has written (1928, 31, 439) a characteristically brief but very informative biographical sketch, which merits reproduction in this notice: "Thomas Henry Green (1842-1923) first produced 'An Introduction to Pathology and Morbid Anatomy' in 1871—a modest duodecimo of 304 pages and 60 elementary woodcuts, of rather a devotional appearance with a sober binding and a title page in red and black; published by Henry Renshaw at 8s. 6d. It was evidently a popular book for the sixth edition—the last to be revised by the author—came out in 1884, grown to 556 pages with 150 figures, and it was translated into Japanese in 1876 and 1886. Subsequent editions, from the seventh in 1889, have appeared under the guidance of Green's colleagues and successors in the medical school of Charing Cross Hospital—S. Boyd, H. M. Murray, W. C. Bosanquet, W. W. C. Topley, G. S. Wilson—and now revised by Dr. Piney, the book reaches its fourteenth version, a respectable seniority equalled among text-books of pathology in English only by Delafield and Prudden." A copy of the fourth edition (1878), presented to the library of the Royal Veterinary College by Professor J. B. Simonds, enables us to recognise a considerable part of its text and several of its illustrations in the volume published 50 years later.

The discussion on "tumours" in the fourteenth edition, which fails to emphasise the difference between hyperplasia, metaplasia, and neoplasia, compares unfavourably with Green's 1878 introduction to the subject. Students, taught in the wards to regard "tumours" as "lumps," turn up their fourteenth edition to read "in pathology the term 'tumour' denotes certain local growths of new tissue, which appear to be excrescences upon the general plan of the organism." We confess to expecting better things of pathology than such a sentence. Since Dr. Piney, in his brief mention of Gye's theory, introduces the term "neoplasia," we fail to understand why, if only in the interest of the student initiate, "neoplasm" should not replace "tumour"; the mistake of regarding hyper- and meta-plastic synovial villi as papillomata (simple epithelial neoplasms) would not occur.

From the merely incidental references to rheumatic disease no student reader could be blamed for failing to recognise the importance of one of the principal causes of disability in Great Britain. The description of arthritis is weak, and the statement on page 419 that in acute infective arthritis "the whole cavity of the joint becomes lined with a layer of granulation tissue" requires considerable amendment. Again, on page 420, the definition of osteoarthritis as "a chronic degenerative process occurring in elderly persons" is inadequate, and leads us to express the hope that the fifteenth edition will reflect the results of the large amount of post-war

study on arthritis. We respectfully call the attention of the reviser to the proceedings of the Conference of Rheumatic Diseases, Bath, 1928.

Compared with some of the drawings of organs the majority of the illustrations are of inferior quality. Figure 93 would more readily convey its lesson upon macroscopic agglutination if each tube was labelled, while Figure 94, illustrating the phenomena of complement fixation requires a colour plate. The drawing of a " mixed tumour " of the parotid gland, and two very good coloured plates of cystic disease of bone, are unaccompanied by any references in the text.

Dr. Piney has made the chapter (27) upon " the diseases affecting the composition of the blood " one of the outstanding features of his revision. His coloured plates of the white cells more nearly approximate to the stained blood films as seen by students in their practical classes than the blatantly painted cells illustrating the majority of text-books. Possibly Dr. Piney might have assisted his students by inserting (in brackets) the long accepted nomenclature for the leukæmias, e.g. (myelogenous) again his myelæmia, and (lymphatic) against his lymphæmia.

Though a large part of our notice is occupied by criticism, and the revision by a single author of a work covering so vast a field is liable to have its weaker patches, we recognise in the fourteenth edition a text-book which to present-day veterinary students should prove acceptable as was Green's " modest duodecimo " to their fathers. The strong binding, clear printing and very reasonable price, are further recommendations to one of the best student's text-books of pathology in the English language.

Geheilte Knochenbrüche bei Wildlebende und in Gefangenschaft Gehaltenen Tieren (Healed Bone Fractures in Wild and Captive Animals). By E. KORSCHELT, Doctor of Medicine and Philosophy, and HERMANN STOCK, Doctor of Philosophy. Berlin: W. Borntraeger Bros., 1928. Pp. 163, 185 figs. in the text. Price: paper backs, 24 marks; bound, 26·50 marks.

THIS is a very interesting book dealing with the natural healing of fractures in mammals, birds, reptiles, and amphibia. It is beautifully and copiously illustrated. A wild animal goes into a secluded place and rests as much as it can until it can place weight on the injured limb and only hobbles about in order to satisfy its need for food. The facts that it has to secure nourishment, and that when maimed it is in greater danger from its natural enemies induces it to get about as soon as ever it can, and leaves no room for malingering and excessive periods of convalescence. The illustrations show that many fractures unite without the ends of the bone being displaced; others heal by bony union, although the broken surfaces over-ride. Some breaks form pseudarthroses (false joints) and others synostoses. The wide field of observation which the authors have had access to has enabled them to produce a really remarkable book which will be valuable, not only to veterinarians but naturalists, wild animal keepers, anatomists and physiologists.

News

Future of the Veterinary School of Melbourne University.

IT has been recommended that teaching for the veterinary degree course should be continued in Melbourne up to the end of the third

year, and that students should then go to Sydney for the fourth year. Also that the University should continue to conduct laboratory, diagnostic and reporting work, together with investigations of outbreaks of disease in animals, for the stock branch of the Department of Agriculture, with University officers, staff, and equipment as at present. The milk laboratory should also continue on present lines. The committee also proposed that a new Act be obtained providing for the above measures, and including provision for ten retainers of £1,500 per annum to veterinary practitioners located in country districts of Victoria.

Number of Veterinary Students in France.

THE number of students admitted to French veterinary schools during 1928 was as follows:—

Veterinary School at Alfort ..	49
Veterinary School at Lyon	34
Veterinary School at Toulouse ..	39

Personal

MR. HENRY J. DAWES, of West Bromwich, was made the recipient of a gold cigarette case and a very handsome rose bowl, the gifts of the members of the Midland Branch of the National Veterinary Association, on the occasion of his re-election for the 38th consecutive year as secretary; a token of esteem and appreciation for faithful service. The prosperity of the Midland Association owes much to the energy of Mr. Dawes, both as regards number of members and prosperity in the other essential points of its affairs; and the gifts which have been so recently presented to him are a fitting acknowledgement.

MR. CLEMENT ELPHICK, M.R.C.V.S., Veterinary Officer for Northumberland County, has just been appointed Official Veterinary Inspector for the Counties of Cumberland and Northumberland under the Hunters' Improvement and National Light Horse Breeding Society.

MR. N. R. REID, B.V.Sc. (S. Africa), M.R.C.V.S., has been appointed Veterinary Officer to Tanganyika Territory.

Publishers' Notices

All communications should be addressed to 7 & 8, Henrietta Street, Covent Garden, London, W.C.2. Telephone: Gerrard 4646. Telegrams: "Baillière, Rand, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Copy of advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 25th of the month, or if proof is required, not later than 23rd.

Binding Cases for Volume 84 and any other previous volumes can be obtained from the publishers. Price 2s. 9d. post free.

Annual Subscription, 21s. ($5.00 U.S.A. currency) post free.